The Management University of Africa

MUA

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UNDERGRADUATE UNIVERSITY EXAMINATIONS

SCHOOL OF MANAGEMENT AND LEADERSHIP

BACHELOR OF MANAGEMENT AND LEADERSHIP

BML 303: OPERATIONS RESEARCH

DATE: 15TH AUGUST 2014

DURATION: 3 HOURS

MAXIMUM MARKS: 70

INSTRUCTIONS:

1. Write your registration number on the answer booklet.
2. **DO NOT** write on this question paper.
3. This paper contains **SIX (6)** questions.
4. Question **ONE is compulsory.**
5. Answer any other **THREE** questions.
6. Question one carries **25 MARKS** and the rest carry **15 MARKS** each.
7. **Write all your answers in the Examination answer booklet provided.**

QUESTION ONE

a) Consider the LP problem
Maximize $Z = 45x_1 + 50x_2$
Subject to $5x_1 + 20x_2 \leq 400$
$10x_1 + 15x_2 \leq 450$
$X_1, x_2 \geq 0$
Solve by simplex method (8 marks)

b) Explain the following concepts in relation to Linear Programming
i. Sensitivity analysis
ii. Feasible solutions
iii. Shadow prices (6 marks)

c) A dealer in electronic goods provides after sale services to his customers. Studies show that the customer arrivals at the shop follows a Poisson distribution with a mean of 3 persons per hour. The service is exponentially distributed with a mean of 4 customer per hour. Based on these information determine:

i. Theproportion of time during which the mechanic is free
ii. The probability of finding at least one customer in the shop
iii. The expected number of customers in the queue
iv. The expected waiting time in the line (8 marks)

d) Describe a transportation network between three sources a_1, a_2, a_3 and four destinations b_1, b_2, b_3, b_4 (6 marks)

QUESTION TWO

A manufacturer makes bicycles and motor bikes each of which must be processed through two machine centres. Machine centre 1 has a maximum of 120 hours available in a week while machine centre 2 has 160 hours availabe in a week. Making a bicycle requires 4hours in machine centre 1 and 3 hours in machine centre2. Making a motor bike requires 4 hours in machine centre 1 and 10 hours in machine centre2. The per unit return of a bicycle is ksh.45 and ksh.55 for a motorbike

i. Determine the number of bicyles and motorbikes to be made and sold in order to maximize returns
ii. If the manufacturer could have targetted cost reductions, what numbers of bicycles and motorbikes could he have manufactured to minimize costs?

(15 marks)

QUESTION THREE

The cost (sh'00) of assigning any one operator to any one machine is given in the following table

	Operator I	Operator 2	Operator 3	Operator 4
Machine A	10	5	13	15
B	3	9	18	3
C	10	7	3	2
D	5	11	9	7

Determine the optimal assignment to minimize costs. (15 marks)

QUESTION FOUR

A firm has 3 branches in different parts of Nairobi, it has received orders for a total of 15 laptop computers from 4 customers, the three branches have a total of 15 laptops available. The management wishes to minimise delivery costs by dispatching the laptops from the approprite branches for each customer. The cost details are given below (sh'00)

	Customer 1	Customer 2	Customer 3	Custome r4	**supply**
Branch X	13	11	15	20	**2**
Y	17	14	12	13	**6**
Z	18	18	15	12	**7**
Total	**3**	**3**	**4**	**5**	

Use least cost method and advice the management (15 marks)

QUESTION FIVE

Discuss the application of the following concepts of operations research in business and manufacturing

i. Linear Programming (6 marks)
ii. Transportation model (3 marks)
iii. Assignment model (3 marks)
iv. Queueing theory (3 marks)

QUESTION SIX

Given the LP problem

Minimize $Z = 10x_1 + 25x_2$

Subject to $25x_1 + 50x_2 \geq 2000$

$15x_1 + 5x_2 \geq 500$

$10x_1 + 75x_2 \geq 1350$

Such that $x_1, x_2 \geq 0$

i. Write the dual problem
ii. Solve the dual problem by simplex method
iii. Describe the optimal solution for the primal problem. (15 marks)